

1983 REPORTResearch School of Biological Sciences

The overall aim of the Research School of Biological Sciences is to advance fundamental knowledge relating to both the structure and function of living organisms on the one hand, and to their development and evolution on the other. Not only is such knowledge fundamental to man's understanding of life on earth but, additionally, it is essential for man's welfare and his capacity to cope with the other organisms with which he shares the earth.

Research Achievements During 1983

Of the numerous discoveries and advances to which School staff have contributed during the past year, which are detailed in our annual report, five are likely to be of particular significance to the Australian community who support the work of the School.

At the molecular level, work in the Department of Genetics has recorded a world first in the successful cloning and sequencing of the human renin gene. The protein renin is known to exert a major effect on blood pressure. The capability of being able to synthesise this protein, now that the controlling gene has been sequenced, opens up a new avenue for the treatment of hypertension in man.

A second molecular finding of some importance comes from work on human oncogenes. These genes are known to play a role in the production of malignant growths and there are at least twenty of them scattered throughout the twenty three chromosome pairs of man. Studies in the Molecular Biology Unit have established that under normal circumstances these oncogenes produce one, or at best, only a small number of RNA, and hence protein, products. In cancerous cells, however, their activity is much enhanced so that they now produce fifty to a hundred times more RNA. This augmentation of gene activity appears to play a direct role in the increased cell division which is a feature of malignant growth. The next step will be to determine how this transformation of an inactive oncogene to a highly active and malignant inducing state comes about.

Building on ANU's long tradition of excellence in vision research, methods have been developed in the Department of Behavioural Biology, for selectively suppressing the activity of specific light sensitive cells in the retina of

the eye of vertebrate animals. The technique involves recording the activity of identifiable single nerve cells within the retina, by means of intracellular electrodes, following the manipulation of light sensitive cells with drugs of known specific action. With this approach it is possible to selectively abolish the retinal pathways which are sensitive to increases and decreases in light intensity. For technical reasons the work is being carried out on salamanders and birds but the principles established are, in general, applicable to all vertebrates, including man.

In the field of plant research the Department of Development Biology has succeeded in producing a synthetic growth substance, or cytokinin, which delays senescence when applied to the leaves of soybean. This treatment has obvious agricultural potential since the ability to delay leaf senescence leads to the maintenance of high nitrogen levels within the leaves.

Of even greater significance from an agricultural point of view, is the discovery, made in the Department of Environmental Biology, that natural variation in the extent of opening of the small pores, or stomata, on the leaf surface can be monitored by characterising the carbon content of leaves isotopically. Since the opening of these pores controls the amount of water lost from a plant by transpiration it is possible, using this novel technique, to screen for, and then subsequently breed from, plants in which the pores open only minimally. The importance of this approach can be gauged from the fact that in drought affected years the loss of revenue of the Australian wheat crop alone is in the order of one thousand million dollars.

Training Roles Within The School

The establishment of the Centre for Recombinant DNA Research, officially opened in 1982, has provided a major focus for the training of molecular biologists within Australia. During the past year some thirty visiting scientists, eighteen from within Australia itself, spent time in the Centre, either learning new techniques or carrying our collaborative research work with the staff of the Centre.

The Centre also played a major role in organising and contributing to a very successful course on "Molecular Genetics and Recombinant DNA Technology" held on a weekly basis during the period March-August in conjunction with the School of Biological Sciences at Sydney University. Finally members of the School staff gave a well attended and very successful extension course on "Recent Developments in Biological Sciences" held under the auspices of the ANU Centre for Continuing Education.

Professor B. John
Director